RS 16000 High Density Gigabit Ethernet Router

Product Overview

The RS 16000 is a new generation of aggregation router designed to aggregate Gigabit Ethernet at line rate while enabling 10 Gigabit metro networks. It provides full Metro service-creation capabilities through a hardware-based architecture in the industry's highest density chassis for Gigabit Ethernet aggregation. The RS 16000 delivers 60 wire-speed Gigabit Ethernet ports in a 5-rack unit chassis, saving rack space and decreasing operational complexity by reducing the number of deployed network elements. The modular chassis is designed to grow as customers are added — the RS 16000 can be deployed with as few as 4 Gigabit Ethernet ports, and is expandable up to 60 full wire-speed Gigabit Ethernet ports. In addition, the RS 16000's bandwidth capacity will scale as the network grows by supporting 8 Gigabit/CWDM and will support 10 Gigabit Ethernet as the standard is finalized.

Like all Riverstone RS routers, the RS 16000 features full-function routing capabilities — OSPF, BGP-4, and IS-IS — as well as an unmatched range of service-enabling features, including on-demand bandwidth provisioning

and hardware-based MPLS VPNs. By supporting Riverstone's Metro-optimized MPLS implementation, the RS 16000 serves as an ideal Label Edge Router (LER) or Label Switch Router (LSR) for deployment of an MPLS VPN, Transparent LAN, or Virtual Leased Line solution. Riverstone's Lightweight Flow Accounting Protocol (LFAP) enables reliable, real-time billing with wire-speed data collection to turn network services into profit generating revenue. Overall, the RS 16000 is designed for maximum capabilities at a minimum size for the most demanding points in a service provider's network.

Applications and Positioning

The RS 16000 is designed for high-density aggregation of Gigabit Ethernet traffic in the metro POP or data center. Whereas the RS 8000 and RS 8600 are positioned as versatile aggregation and access routers capable of processing traffic over any media type, the RS 16000 is targeted specifically at Gigabit aggregation opportunities. With 10 Gigabit Ethernet and CWDM uplinks, the RS 16000 is also suitable for building out a metro core and providing high-speed uplinks to the Internet core edge. The RS 16000 features the same core technology as the rest of the RS family, including a common set of ASICs and the same system software, enabling it to support the full range of service applications available with other Riverstone products.

Key Benefits and Selling Points

Highest Gigabit Ethernet port density on the market: Higher port density means reduced colocation costs and greater revenue potential per rack. Dense routers also enable service providers to reduce the number of network elements, leading to simpler networks and lower operating costs. The RS 16000 is the densest Gigabit aggregation platform on the market by far.
- 60 wire-speed GbE ports in a 5-rack unit form factor (8.75 inches) – over 70% more ports per rack-inch than the nearest competitor
- Up to 540 GbE ports in a standard 7-foot rack – almost 90% greater capacity than the nearest competitor

Massive scalability and uplink capacity: Service providers need substantial uplink capacity to backhaul their metro POP and data center traffic, and to build out regional transport networks. The RS 16000 meets this need with a choice of high-capacity uplink options.
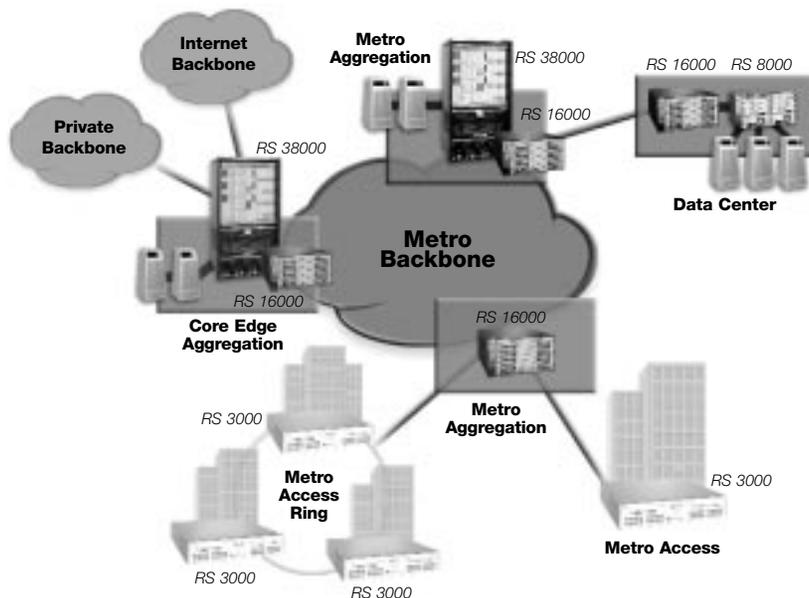- Wire-speed 10 Gigabit Ethernet, scheduled for release in the near future
- CWDM links delivering 4 Gbps of bi-directional data over a single pair of fiber and transport over distances up to 70 km
- Modular, chassis-based platform that allows scaling from 4 to 60 wire-speed GbE ports
- 170 Gbps switch fabric capacity, ensuring wire-speed performance even when router is fully populated

Cutting-edge service capabilities: The RS 16000 supports an unrivalled range of service-enabling technologies, allowing service providers to seamlessly extend value-added services across the metro to the core edge. Hardware implementations ensure wire-speed performance with all features enabled. Key service-enabling technologies include:
- Carrier-class routing, featuring Tier 1-certified implementations of OSPF, BGP-4, and IS-IS
- Metro-optimized MPLS in hardware, enabling the RS 16000 platform to act as an LER or LSR to extend VPN and traffic prioritization services across the metro, across the country, or around the world
- Reliable support for the full 4,096 VLANs specified in 802.1q, and VLAN to LSP mapping
- Hardware-based rate limiting on every port, enabling dynamic bandwidth provisioning at the wholesale level
- Irrefutable services accounting at wire-speed, featuring the industry's only connection-oriented accounting solution with full RMON I and II on every port in hardware

Internet Backbone · Private Backbone · Metro Aggregation · RS 38000 · RS 16000 · RS 8000 · Data Center · RS 16000 · Metro Backbone · Core Edge Aggregation · RS 3000 · Metro Aggregation · Metro Access Ring · Metro Access · RS 3000

RS 16000

Ordering Information

RS 16000 Base Module

Part Number	Description
R16-CHS	Chassis, which includes backplane, switching fabric, clock
R16-CM4EG-04	Control module with 256 MB (upgradeable to 512 MB), 1 RJ-45 10/100 port, and 4 non-MPLS Gigabit Ethernet ports
R16-CM4EF-12	Control module with 256 MB (upgradeable to 512 MB), 1 RJ-45 10/100 port, and 12 10/100 ports through a telco adapter
R16-PDC	DC power supply
R16-PAC	AC power supply

RS 16000 Ethernet Modules

R16-GSFEM-08	8-port SFP GbE Card (requires SFP GBICs)
R16-GSFNM-08	8-port GbE SFP Card MPLS (requires SFP GBICs)
SFP-SX*	1-port MMF SFP SX (Quantity 4)
SFP-LX*	1-port SMF SFP LX (Quantity 2)
SFP-LH*	1-port SMF SFP LH
R16-WDME8B-02	CWDM bi-directional
R16-WDME8U-02	CWDM uni-directional

Other Components

SYS-OS-16	RS Router Services: Include IP routing (RIP v2, OSPF, BGP), QoS services. One required with every RS chassis, shipped on 16 MB PCMCIA card
SYS-PCM16	RS 8x00, 16000, and 38000 16 MB PCMCIA card – (ships with SYS-OS-16, second required for redundant CM configuration)

*SFP small form factor plugable or mini GBIC

Minimum Configuration

- Base chassis
- Power supply
- Control module
- System OS
- Line card and SFPs

RS 16000

Competitive Matrix

Features	Riverstone RS 16000	Foundry BigIron 4000	Foundry BigIron 8000	Extreme Alpine 380x	Extreme Black Diamond 6808	Cisco Catalyst 6509
Service-Enabling Technologies						
Hardware-based MPLS	*Yes*	*Yes*	*Yes*	*No*	*No*	*Yes*
Hardware-based rate limiting	*Yes*	*No*	*No*	*Yes*	*Yes*	*Yes*
Support for 4,096 VLANs	*Yes*	*Yes*	*Yes*	*No*	*No*	*Partial**
20,000 ACLs at wire speed	*Yes*	*No*	*No*	*No*	*No*	*No*
Hardware-based NAT	*Yes*	*No*	*No*	*No*	*No*	*No****
Superior Connectivity	*Available media interfaces and port densities*					
GbE ports per rack	*540*	*288*	*256*	*128*	*128*	*128***
10 GbE support	*Yes*	*No*	*No*	*No*	*No*	*No*
CWDM support	*Yes*	*No*	*No*	*No*	*No*	*No*
Accounting Features						
Real time billing data	*Yes*	*No*	*No*	*No*	*No*	*No****
(wire speed accounting features on all ports)						
Full RMON I and II in hardware	*Yes*	*No*	*No*	*No*	*No*	*No*
Protection against lost accounting data (connection-oriented accounting)	*Yes*	*No*	*No*	*No*	*No*	*No*
BGP accounting at wire speed	*Yes*	*No*	*No*	*No*	*No*	*No*

*   Certain configurations of the 6509 can support 4096 VLANs, but many do not.
** Based on vertical slot model with 256 Gbps backplane. Increasing port count would require use of non-NEBS-compliant horizontal slot model or smaller (30 Gbps) switch fabric, which is insufficient to handle high port counts.
*** This functionality is available through an additional specialized line card that increases expense and decreases port density.

Technical Specifications

(See tables on pages 9–12 for additional platform features)

Platform Features

Hardware-based MPLS
IP routing, unicast, and multicast
Routing in hardware on each line card
LSR and LER MPLS support in hardware
RSVP-TE and LDP-CR traffic engineering support
Security (ACLs, L2 filters)
Layer 4 application-flow switching and QoS
Network Address Translation (NAT)
Hardware-based Rate Limiting
Jumbo Frame support
VLANs based on port or protocol
Managed Services Server Load Balancing (LSNAT)

Highly Fault Tolerant

Redundant CPU, power supplies
Hot-swappable media modules
Standards-based VRRP
Layer 2 and 3 redundant protocol support

Extensive Management

Wire-speed full RMON/RMON2
SNMP manageable
SSH and Telnet client secured by:
RADIUS
TACACS+
RS-232 (out-of-band management)
Command Line Interface (CLI)

Interfaces

- 10/100 Base-TX (on control module)
- 1000 Base-SX (with or without MPLS)
- 1000 Base-LX (with or without MPLS)
- 1000 Base-LH (with or without MPLS)
- 4 GbE Lambda on bi-directional CWDM (intermediate range)
- 4 GbE Lambda on uni-directional CWDM (long range)
- 10 GbE (scheduled for release)

Specifications

Up to 4,096 VLANs
Up to 250,000 routes
Up to 20,000 security/access control filters
Up to 1,600,000 Layer 2 MAC addresses
Up to 8,000,000 Layer 4 application flows
Up to 170 Gbps non-blocking switching fabric
Up to 90 million packets-per-second routing throughput
MTBF (predicted) > 200,000 hours

Capacity and Performance

Up to 170 Gbps non-blocking switching fabric
Up to 90 million packets-per-second routing throughput
MTBF (predicted) > 200,000 hours

Physical

Dimension:	8.75" H x 17" W x 22" D (22.2 cm x 43.2 cm x 55.9 cm)
Weight:	approx. 50 lbs (20 kg)